Energy & Sustainability Strategy

Wonderful Barn

Kildare County Council
For Planning

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Delivering a better world

Quality information

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1. Introduction

The purpose of this document is to outline the proposed energy conservation and sustainability approach for the Wonderful Barn Development. The goal of this strategy will be to provide highly efficient, low energy and sustainable community facilities. These facilities will minimise the carbon footprint of the development and provide an exceptional environment while respecting the significant historical importance of the buildings.

Reducing carbon dioxide emissions into the atmosphere to reduce impact on climate change is a one of the major objectives of sustainable development. The purpose of this document is to outline the energy efficiency measures, on site generation and embedded renewable energy strategies that will be adopted to substantially reduce the energy demands and carbon emissions from the proposed Wonderful Barn development.

1.1 Outline Description of Development

The proposed Redevelopment of The Wonderful Barn comprises an area of c.19.8 HA and incorporates the renowned protected structure of the Wonderful Barn and its ancillary buildings, all protected structures, including Barnhall House, two dovecotes, a walled garden and two ranges of adjacent courtyards containing former farm buildings and the public parklands enclosed by the M4 motorway to the South, Celbridge Road R404 to the East and suburban residential developments to the North and West.

The proposed works will protect and enhance the rich architectural heritage and amenity of the Wonderful Barn and adjacent buildings and provide an integrated public amenity park and tourism destination at The Wonderful Barn and associated lands, informed by a detailed conservation and management plan.

The proposed works will comprise of the following:

- Repair, restoration and minor interventions within and to the Wonderful Barn, Barnhall House, two dovecotes, a walled garden and two ranges of adjacent courtyards and former farm buildings to improve and accommodate existing tourist and community amenities and facilities.
- Provision of a 115sqm extension to former farm buildings to provide a commercial kitchen and café with southern outlook into the historic walled working vegetable garden amenity.
- Redevelopment of the current 55 no. allotments to realign the plots within the restored historical landscape axes and provide new and improved facilities for the local allotment users.
- Provision of a new 174sqm building to the East of the existing building complex which will provide a storage facility to replace an existing container on site, new toilets, kitchenette and workshop facilities for the local allotment user group as well as short term workplace facilities for the KCC Parks Department.
- Provision of water and power outlet market facilities adjacent to the new building to accommodate weekly / monthly local markets.
- Improvements and upgrading of existing pedestrian footways and provision of new pedestrian footways and cycle pathways throughout the site.
- Development of a new pedestrian and cycle link through the Wonderful Barn; a continuation of the pedestrian and cycle link (outside of the project boundary) from Celbridge/Backweston to Leixlip, via Castletown House, through Kildare Innovation Campus (former Hewlett Packard site), across the proposed M4 overpass to the Wonderful Barn and onto Leixlip Town Centre and Leixlip Louisa Bridge Station, in accordance with the requirements of TII publications.
- Protection and reinstatement the axial views between Castletown House and the Wonderful Barn and undergrounding of overhead cables.

- Protection and reinstatement of the integrity of the historic landscape including the Southern and South-Western formal tree lined avenues and forecourt to Barnhall House, formal planting of the walled garden, formal planting of the historic orchard to the Northwest of the building complex and an historic treeline and hedgerow to the Northern boundary of the courtyards.
- Realignment and improvements to pedestrian, cycle and vehicular access to site.
- Provision of new carpark with 65no. of carparking spaces, 28no. of bike parking spaces and 4no. bus pick-up / drop-off bays.
- Provision of new street furniture, seating and public lighting throughout the parkland.
- Provision of new wayfinding and signage throughout the parkland.
- Provision of all utilities, necessary services, drainage works and associated site works.

Please refer to the statutory Part 8 notices which provide a full description of the proposed development including the breakdown of applicable floor areas.

2. Design Basis & Approach

Building energy efficiency and sustainability involves all designers and stakeholders from the start of the design process. The most successful sustainable sites are those which keep energy efficiency and sustainability at the core of project from design through to construction.

The 4 main principles to achieve energy efficient buildings are:

Reduce: Reduce energy consumption by passive and active means, for example improving building fabric and utilising low energy equipment.

Reuse: Reuse energy & materials where possible by recovering waste energy where possible.

Renewables: Utilise renewable technologies to offset energy from fossil fuel technologies.

Rethink: Constantly rethink and refine the energy & sustainability strategy and approach.

The potential strategies outlined in this report are based around these principles.

The new building will be designed to meet Part L of the Building Regulations (Conservation of Fuel and Energy – Buildings other than Dwellings) 2022 incorporating Nearly Zero Energy Building (NZEB) standards. The existing protected structure will meet the requirements of Part L where possible within the conservation strategy.

3. Energy Conservation Approach

3.1 Passive Energy Reduction

The first step to implementing a low energy design for the Wonderful Barn development will be to reduce the energy required to heat the buildings using passive means. For the new building and Café Extension this will include the specification of a high-performance building fabric with u values exceeding that of the backstop values in Part L of the Building Regulations – Conservation of Fuel & Energy (Buildings other than Dwellings) 2022.

For the existing protected structures, the thermal performance of the existing fabric will be improved through the of additional of insulation on walls, floor and roof, unless prohibited by the conservation strategy. The following thermal upgrades are proposed:

Wonderful Barn

Floor: Relay existing brick on top of new floor build up: Insulated limecrete floor - limecrete slab with Underfloor heating, sub-base: 350mm compacted down to 250mm Glapor recycled foam glass gravel aggregate or equivalent – loadbearing hardcore. U value 0.2 W/m^{2}K.

Barnhall House

Roof: Insulated at ceiling. 100mm between rafters and 200mm above rafters. Gutex thermoflex or equivalent. U value of 0.14 W/m^{2}K

Insulated limecrete floor: Limecrete slab with Underfloor heating, sub-base: 350mm compacted down to 250mm Glapor recycled foam glass gravel aggregate or equivalent – loadbearing hardcore. U value 0.2 W/m^{2}K

Windows & doors: Timber sash windows with slimeline heritage double glazing. Timber doors. U values to be confirmed at the next stage of the design.

Farmyard Buildings

Walls: Lime based Insulating plaster, applied internally on solid masonry stone wall (550 - 650mm thickness of existing wall) - Diathonite 'Thermactive' or equivalent up to 50mm, thermal conductivity: 0.037 W/mK, lime based plaster on outside (expose stone) – breathable waterproof: diasen BKK eco – U-value achieved: approx. 0.7 W/m^{2}K.

Roof: New pitched roof build up: Timber rafters, osb sheathing above structure, breather membrane Solitex Adhero 3000 or equivalent, Insulation on slope: Gutex Multitherm or equivalent applied in single layer up to 100mm or multi-layered to a greater thickness, Low resistance breathable roofing underlay, roof battens and counter battens, slate tiles. U-value 0.39W/m^{2}K.

Insulated concrete floor: Flooring, UFH, insulation below concrete slab, insulation/subbase: 350mm compacted down to 250mm Glapor recycled foam glass gravel aggregate or equivalent – loadbearing hardcore. U value for floor : 0.2 W/m^{2}K.

Windows, doors & rooflights: New contempary units achieving U value of 1.4 W/m^{2}K.

Note all of the above figures are indicative, the exact figures will be confirmed at the next stage of the design when more detailed design is carried out.

In all areas air tightness and thermal bridge details will be carefully designed to limit heat loss. Glazing will be specified to reduce solar gain while still providing adequate daylight. In certain areas blinds (automatic or manual) will be provided to reduce solar gain.

3.2 Heating and Renewable Strategy

Space heating throughout including the Wonderful Barn, Barnhall House, Farmyard Buildings and the new building will be provided by renewable heat pump systems. Air or ground to water heat pumps will be used; the exact technology used will be confirmed following a feasibility assessment at the next stage of the design. 3nr. heating systems will be provided as follows;

1. Serving the Wonderful Barn & Barnhall House
2. Serving the Farmyard Buildings & Café Extension
3. Serving the new building.

Space heating in the Wonderful Barn will be provided by an underfloor heating system.

In Barnhall House space heating will primarily be provided via an underfloor heating system installed between the joists at 1st floor level and installed within the slab at ground level. Depending on the heat loss of each space it may be necessary to supplement the underfloor heating with perimeter radiators, this will be confirmed at the next stage of the design.

In the Farmyard Buildings and Café Extension space heating will primarily be provided via an underfloor heating system installed within the slab at ground level. Depending on the heat loss of

each space it may be necessary to supplement the underfloor heating with perimeter radiators, this will be confirmed at the next stage of the design.

Space heating in the new building will be provided by perimeter radiators.

3.3 Ventilation Strategy

3.3.1 Wonderful Barn

For conservation reasons no mechanical ventilation is proposed for the Wonderful Barn.

3.3.2 Barnhall House

Barnhall House will be ventilated with a Continuous Mechanical Extract (CME) ventilation system. A CME extract unit will extract air on a continuous basis from all wet rooms e.g. bathrooms, kitchenettes etc. and discharge to outside via a roof tile vent. The CME extract air volumes will be sized in accordance with Part F of the Building Regulations and will vary depending on the humidity in the spaces.

In addition, each non wet room space will be provided with a wall mounted air quality sensor / indicator. This device will give the occupant a visual indication of humidity and CO_2 levels in the space via a traffic light *(green / amber / red)* indicator. This indicator will prompt the occupant to open the window when the air quality *(as indicated by the humidity / CO_2 sensor)* is poor.

Figure 1. Typical Air Quality traffic light indicator

3.3.3 Farmyard Buildings

The toilet area will be ventilated using a packaged mechanical ventilation with heat recovery (MVHR) unit. The extract air will be used to heat the incoming fresh air to reduce heating energy consumption via a high efficiency heat exchanger within the MVHR unit.

The community rooms will be naturally ventilated via openable windows. Air quality sensors, as shown in Figure 1, will also be provided.

The extent of ventilation in the kitchen area will be dependent on catering requirements and will be confirmed at the next stage of the design.

3.3.4 Café Extension

The Café extension will be naturally ventilated to maintain air quality and reduce overheating. The outline natural ventilation strategy is indicated in Figure 2 below. The natural ventilation design strategy will be developed using dynamic simulations and overheating analysis at the next stage of the design.

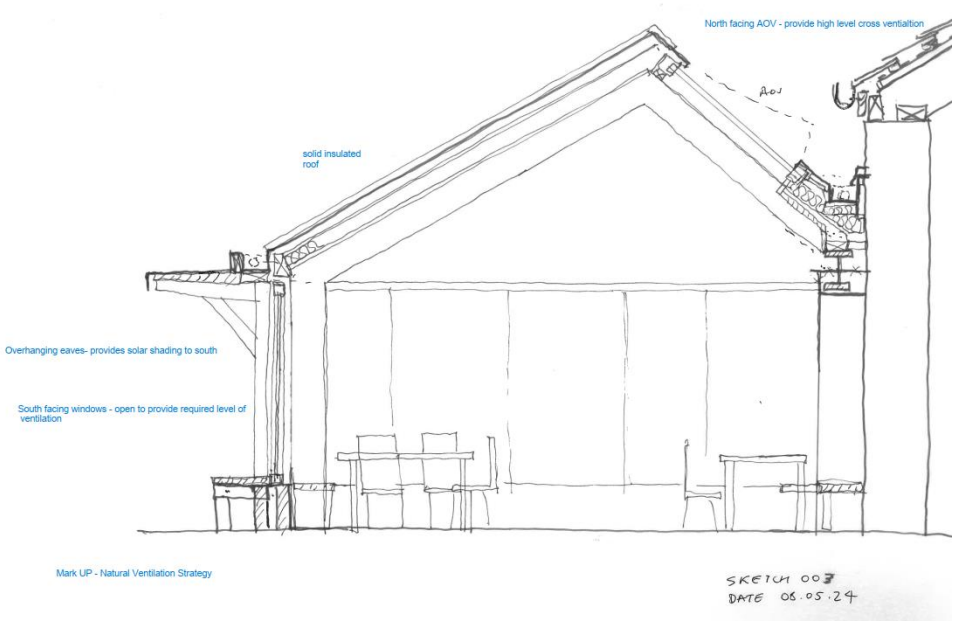

Figure 2. Café Natural Ventilation Strategy

3.3.5 New Building

The new building serving the allotments and the KCC facility will be ventilated using a packaged mechanical ventilation with heat recovery (MVHR) unit. The extract air will be used to heat the incoming fresh air to reduce heating energy consumption via a high efficiency heat exchanger within the MVHR unit.

3.4 On Site Renewable Energy Generation

For conservation reasons it is not possible to install photovoltaic arrays on Barnhall House or the Farmyard Buildings.

The provision of a photovoltaic array over the new building will be considered at the next stage of the design.

3.5 Lighting

Lighting will account for a significant proportion of the energy consumption of the Wonderful Barn. The strategies that will be employed in the design of the Wonderful Barn to reduce the energy consumption from lighting will be:

- Careful lighting design in all areas to provide adequate lux levels while eliminating over provision / over design of lighting
- Selection and specification of low energy use light fittings through including LED’s where practical
- Careful specification of lighting controls which may include occupancy sensing, daylight sense and smart lighting control systems.
- All external lighting will be on a photocell / solar clock so that switching times and lux levels can be arranged to align with daylight levels.

3.6 Domestic Water Usage

The design for the Wonderful Barn will seek to reduce hot and cold-water consumption insofar as possible. Some of the measures that will be considered included minimising domestic hot water storage losses, the use of low use water fittings and the reduction of circulation losses through high levels of insulation.

A rainwater harvesting system will be used to collect roof run off in the stables area to provide water for toilet / urinal flushing. A rainwater harvesting system to provide irrigation water for the allotments will also be considered at the next stage of the design.

3.7 Controls

A fully automated Building Management System (BMS) will be provided to control all HVAC systems. The BMS will incorporate fully automated temperature control systems and will include automated optimisation strategies to minimise energy consumption. Energy metering will also be provided, allowing the end user to accurately monitor energy consumption and identify high energy users. This data can in turn be used to fine tune the control strategies to improve efficiency.

The use of smart building technologies can significantly reduce the energy consumption of buildings. The latest proposals from the EU for the revised Energy Performance of Buildings Directive (EPBD) recognise this and the revised EPBD will place much more emphasis on smart building technologies into the future. The use of smart building technologies will be considered where practical for the Wonderful Barn.

3.8 Other Measures

Other energy conservation measures that will be employed on the Wonderful Barn include:

- Variable speed drives will be provided on all motors greater than 1kW.
- Weather compensated heating system controls will be used throughout.
- EC fans will be used on all ventilation systems.
- Low / zero Global Warming Potential (GWP) refrigerants will be used on heat pumps and Comms Room cooling systems.
- Lifts with regenerative drives will be used where feasible.
- Materials with low or zero volatile organic compound (VOC) content will be used to maximise Indoor Air Quality (IAQ).
- Kildare County Council have committed to providing appliances that use energy from the SEAI Triple E register or equivalent.

4. Utilities Diversions

4.1 Existing Above Ground Utilities Infrastructure

The existing above and below ground electricity infrastructure on the site is shown in Figure 3 below:

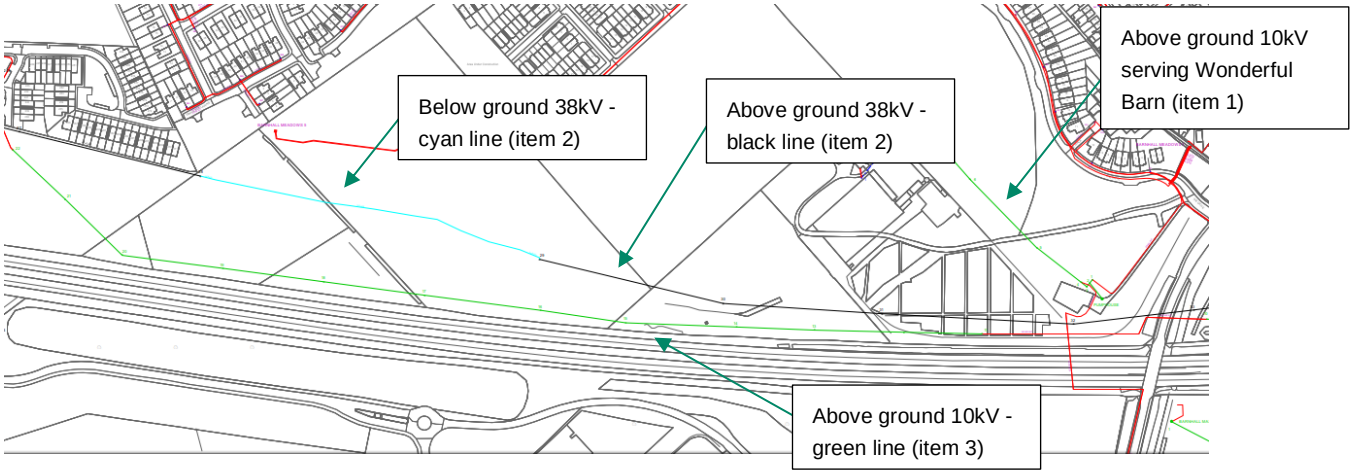

Figure 3. Extract from ESB Networks map of the electricity network in the vicinity of the Wonderful Barn.

Cyan indicates 38kV below ground, Black indicates 38kV above ground, Green indicates 10kV above ground, red indicates 10kV below ground.

Source: ESBN maps

1. An electricity supply is provided to the Wonderful Barn via a 10kV overhead line from the southwest, which feeds a pole mounted transformer just outside the yard area as indicted in Figure 3 and Figure 4. From here the low voltage line runs overhead across the yard before entering the south corner of Barn Hall House below ground. The main electrical switchboard is inside the door of Barn Hall House. The 10kV line described above is overhead as far as the pumphouse to the southwest, with existing below ground ducting from this point into the wider electricity network.

Figure 4. Existing above ground electricity lines feeding Wonderful Barn

(Left) existing pole mounted transformer to the west of the Wonderful Barn, (Centre) above ground low voltage line feeding the Wonderful Barn from the pole mounted transformer, (Right) Barn Hall House distribution board

2. A 38kV above ground transmission line traverses the site from east to west and south of the Wonderful Barn as indicated in Figure 3 and Figure 5. A section of this 38kV line, which traverses the recently constructed / in construction Barnhall Meadows development, has been diverted underground. The line remains above ground from the boundary of the Barnhall Meadows development and the Wonderful Barn parkland to the southwest and traversing the site to the east.

Figure 5. Existing 38kV line traversing the site

3. A 10kV above ground distribution line traverses the site from east to west adjacent the M4 motorway. This line is south of the Wonderful Barn and south of the 38kV line described above. This line goes below ground to the southeast of the site in the vicinity of the existing pumphouse, before distributing to the wider ESB network to the north, south and east.

4.2 Proposed Utilities Diversions

To improve the site amenity and to protection & reinstate the axial views between Castletown House and the Wonderful Barn several of the existing above ground electricity lines traversing the site will be diverted below ground, as described in this section.

1. The 10kV above ground line currently feeding the Wonderful Barn, as indicated in Figure 3 (item 1), Figure 4 and Figure 6 (highlighted), will be replaced with a new below ground supply.

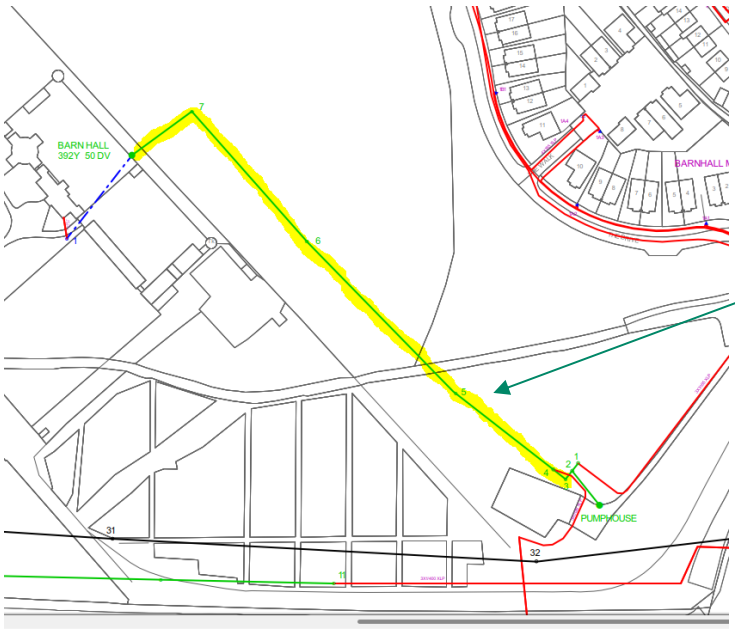

Figure 6. Existing 10kV serving Wonderful Barn to be diverted below ground

2. As part of the proposed M4 Pedestrian and Cycle Overbridge project, a section of the above ground 10kV line to the south of the site (Figure 3 item 3) above, will be undergrounded. The extent of the line to be undergrounded is indicated on drawings A-CSE-GEN-XX-DR-C-2502 &2503 as included with the planning application for the overbridge (KCC planning ref: 2360047), and in Figure 7 below (highlighted).

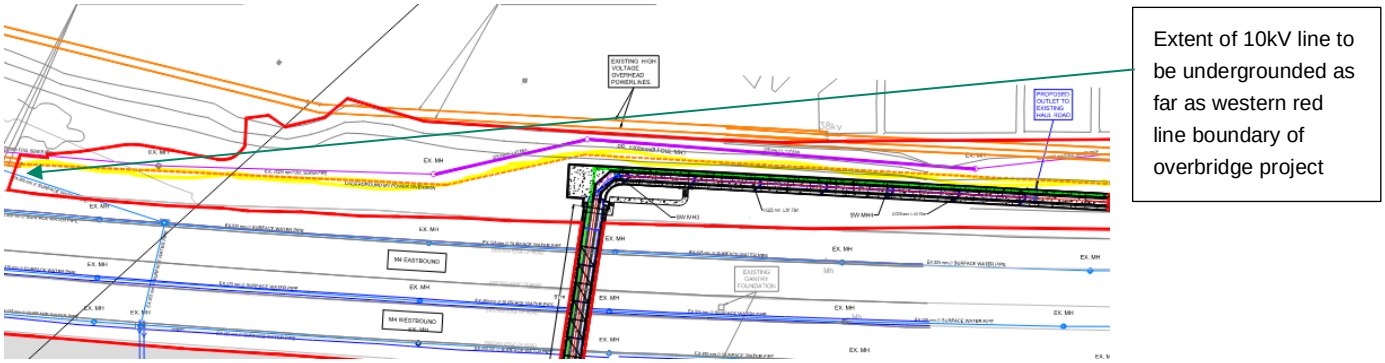

Figure 7. Extent of 10kV line to be undergrounded as part of the overbridge project.

This includes the full extent of the line to the east as far as the existing below ground tie in (not shown).

Source: KCC planning ref. 2360047

The remaining section of the above ground 10kV line, from the eastern redline boundary of the overbridge project indicated in Figure 7 to the below ground tie in just south of Beech

Park, will be undergrounded. The approx. extent of this diversion is indicated in Figure 8. Following this diversion there will be no above ground 10kV lines traversing the site.

Figure 8. Extent of 10kV line to be undergrounded as part of the Wonderful Barn project

Source: ESBN maps

3. The undergrounding of the 38kV line traversing the site, as shown in Figure 5 and as indicated in black in Figure 3 (item 2), is currently being explored with ESB Networks. This proposal will be confirmed at the next stage of the design.

5. Embodied Carbon & Materials

The use of construction products leads to a wide range of environmental and social impacts across the life cycle through initial procurement, wastage, maintenance and replacement. Taken together, construction products make a highly significant contribution to the overall life cycle impacts of a building. In some cases, they may even outweigh operational impacts (such as energy consumption). The introduction and development of Part L into the building regulations has led to significant reductions in the operational energy consumption of buildings and these regulations are being progressively tightened. As a result, greenhouse gas emissions from other aspects of buildings, such as embodied emissions, are becoming increasingly important in terms of reducing the overall emissions that lead to climate change and arise from the procurement, maintenance and replacement of construction products over the building's lifetime. In addition to climate change, there are several other embodied environmental impacts associated with construction products and the processes that occur during and after construction that should be considered during design, for example corporate social responsibility and other regulatory obligations.

In this context, the selection of materials for the Wonderful Barn redevelopment will aim to reduce the burden on the environment from construction products by recognising and encouraging measures to optimise construction product consumption efficiency and the selection of products with a low environmental impact (including embodied carbon), over the life cycle of the building.

Where possible locally produced products will be used thus minimising the embodied carbon associated with transport. Where timber products are specified only products with the Forest Stewardship Council's (FSC) Trademark or other label from an equivalent internationally recognised, globally applicable, independent certification system for good forest management will be used. Metrics for recycling waste during construction will also be set.

6. Sustainability Transport Infrastructure

The purpose of this section is to outline the sustainable transport infrastructure that exists and that will be provided as part of the project to facilitate sustainable transport to and from the proposed Wonderful Barn development.

6.1 Public Transport

Figure 9 shows the existing public transport service stations and stops in proximity to the Wonderful Barn and includes a 10-minute walking catchment for scale.

Figure 9. Public Transport Stations and Stops

Source: https://app.traveltime.com / https://www.openstreetmap.org

6.1.1 Bus

The site benefits from its proximity to six local bus routes (L58, X32, 52, C5, L59, X25), operated by Dublin Bus and can be reached within a 17-minute walk of The Wonderful Barn site. Table 1 summarises the bus service, route, bus stop, distance (metres) and walking time (minutes) from the site.

Table 1. Local Bus Services

Service	Route	Bus Stop	Distance	Walk time (mins
L58	Hazelhatch Station	Elton Court		
	River Forest	Leixlip Park	600 – 900m	8-12
X32	Earlsfort Terrace	Leixlip Park		
L59	River Forest	Lough na Mona		
	Hazelhatch Station	Barnhall Road		
52	Ringsend Road	Lough na Mona	C 1.2km	17
	Leixlip Intel	Barnhall Road		

Service	Route	Bus Stop	Distance	Walk time (mins
C5	Ringsend Road	Lough na Mona		
	Maynooth	Barnhall Road		
X25	UCD Belfield	Barnhall Road		

Source: https://www.dublinbus.ie/ | https://www.transportforireland.ie/plan-a-journey/

6.1.2 Heavy Rail

Leixlip (Louisa Bridge) Train Station is located approximately 2.1km north of the site and can be reached within a 28-minute walk or 9-minute cycle from the site. Leixlip (Louisa Bridge) Train Station is operated by Irish Rail and serves routes between Dublin Connolly – Sligo and Dublin – Longford (commuter service, Maynooth service and Sligo/Longford service).

Table 2 summarises the routes and frequencies that can be accessed from the site's nearest Train Station.

Table 2. Train Services and Frequencies from/to Leixlip Louisa Bridge Station

		Frequency		
Route	Journey Time	Weekday	Saturday	Sunday
To: Dublin Connolly	33 mins	1 service every 15 mins during peak hours	1 service every 20 mins	
To: Maynooth	12 mins	1 service every 30 mins during peak hours		

Source: https://www.transportforireland.ie/plan-a-journey/

Facilities including car parking and bicycle parking/storage are available at Leixlip (Louisa Bridge) Train Station.

Hazelhatch Train Station is located 6km (60-minute walk) to the south of the site which provides access to services to Dublin Heuston and Portlaoise.

6.2 Active Travel Measures

6.2.1 Baseline Connectivity

This section reviews and describes the existing connectivity and accessibility of the site by active and sustainable travel modes, (i.e., on foot, by bicycle) including the site's proximity to public transport stations and stops that may be used by users/visitors of the redevelopment site.

6.2.1.1 Existing Pedestrian Environment

A footway approximately 2m in width is provided on the northern side of Barnhall Meadows and uncontrolled pedestrian crossings provided with dropped kerbs and tactile paving are provided at various intervals along the length of Barnhall Meadows connecting the northern footway with the site, as shown in Figure 10.

Source: AECOM Site Visit Photograph (14/07/22)

Figure 10. Barnhall Meadows Uncontrolled Pedestrian Crossing

On the R404 pedestrians benefit from footway provision approximately 3m in width on both sides of the road and controlled pedestrian crossings, with dropped kerbs and tactile paving, are provided on each arm of the R404 Celbridge Road / Barnhall Meadows signalised junction.

6.2.1.2 Existing Cycling Environment

In proximity to the site, Barnhall Meadows and the R404 Celbridge Road do not have any dedicated or advisory cycle facilities at present, and so cyclists travelling along these roads would need to share the carriageway with vehicles. The R404 Celbridge Road is identified in the Leixlip Local Area Plan (2020 – 2023, extended to 2026), illustrated in Figure 3-2, as primary cycle route LP2 Barnhall Road to Celbridge via Castletown Demesne cycle route.

Green Lane to the north of the site has segregated shared footway/cycleways on each side of the carriageway. Advisory cycle lanes are provided in both directions on the section of the R148 Station Road between its roundabout junction with the R449 until its signalised junction with Green Lane, which forms the LP1 R148 Main Street and Maynooth Road cycle route.

Figure 11 shows the existing cycle network in the vicinity of the site.

Figure 11. Existing Cycling Facilities

Source: https://www.openstreetmap.org

Cycling is growing in popularity and has the potential to replace short-car trips, particularly for trips under 5km. At an average speed of 17km/h this would relate to a journey time of approximately 20 minutes. Figure 12 indicates areas accessible from the site within a 20-minute cycle (in blue) and within a 30-minute journey time on public transport (in red) respectively from the application site.

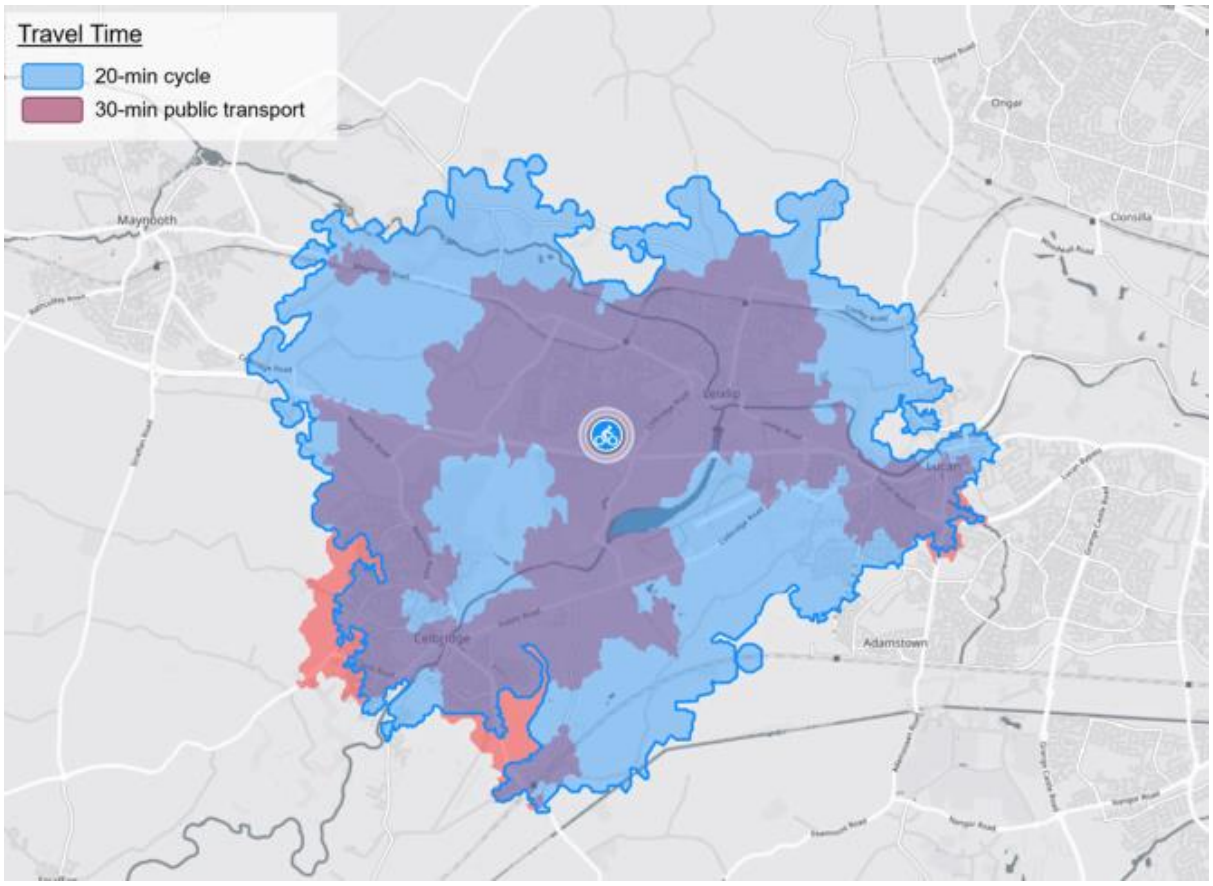

Figure 12. Cycling Catchment - 20-minute cycling isochrone (c. 5km)

Source: https://app.traveltime.com

Figure 12 demonstrates that it is possible to access a relatively significant catchment extending throughout Leixlip, Celbridge and beyond, in a shorter timeframe (20-minutes) when compared with the areas covered by a 30-minute journey time on public transport services.

6.2.2 Proposed Active Travel Measures

Pedestrian access from Barnhall Meadows has been recessed into the site to divert pedestrians away from the vehicular access. A shared pedestrian and cycle raised table crossing, 6m in width and provided with tactile paving is proposed approximately 20m from the site access junction. Ladder and tram paving is shown in Figure 13, alerting pedestrians travelling into the site from Barnhall Meadows that they are entering shared surface crossing point.

Figure 13. Proposed Pedestrian Access and Shared Pedestrian and Cycle Crossing

Source: AECOM Landscape Strategy Drawing

Within the site a series of improved, interconnected on-site shared primary pedestrian and cycle routes measuring 4m in width and lined with public lighting are proposed as shown in Figure 14.

In addition to the primary routes, pedestrian footpaths measuring 2m in width (shown in grey in Figure 3-24) connect the primary shared pedestrian/cycle routes with the different open parkland areas including natural playground, skate park, informal kickabout areas, meadows and dog runs which are expected to have lower footfall than the primary routes.

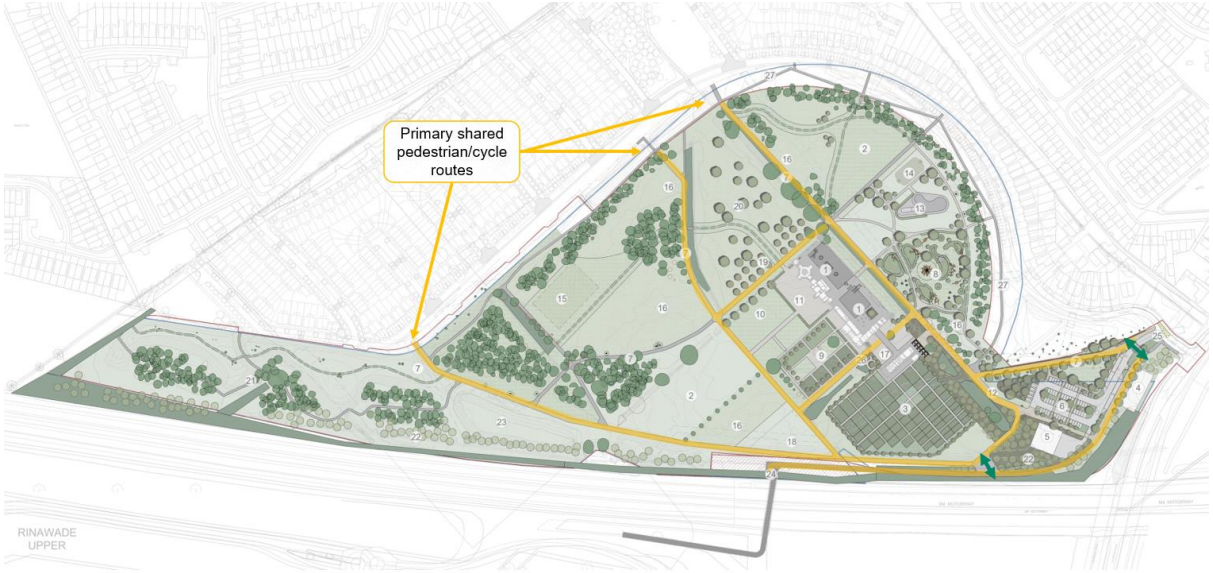

Figure 14. On-site Pedestrian and Cycle Routes and Connections

Source: AECOM Landscape Strategy Drawing

The Wonderful Barn scheme proposes a shared pedestrian cycle route (4m in width) that will connect the site with the Kildare Innovation Campus via a pedestrian and cycle overbridge (across the M4) proposed (by others). The proposed pedestrian/cycleway will be routed at the south-eastern corner of

the site, adjacent to the main car park and will lead to the proposed shared crossing, where cyclists will join and continue their journey via the carriageway.

Strategically, the proposed internal route within The Wonderful Barn site allows for future connections to planned cycle infrastructure improvements along the R404 Celbridge Road towards Leixlip Town Centre, to be delivered by Kildare County Council.

The existing pathway at the perimeter of the site and outside of the red line boundary will remain unchanged by the redevelopment proposals at the request of KCC and these perimeter routes are expected to form informal pedestrian routes.

6.2.3 Cycle Parking Strategy

To comply with the minimum cycle parking provisions required by the KCC Development Plan's (2017-2023) Chapter 15, Cycle Parking Guidance, a recreational centre should provide a minimum of 1 cycle parking space per 50sqm, equating to a provision of 23 cycle parking spaces (1,137sqm / 50).

28 cycle parking spaces are proposed for The Wonderful Barn site, exceeding the minimum provisions to comply with policy. The proposed on-site cycle will comprise a mixture of sheltered cycle parking areas and Sheffield stands within the landscape to cater for both long-stay staff and visitor parking and short-stay visitors respectively.

The on-site cycle parking will be in proximity of The Wonderful Barn and on-site buildings, ensuring passive surveillance and public lighting in accordance with Table 15.4 of Chapter 15 of the KCC Development Plan 2023 – 2029.

The provision of cycle parking and on-site cycleways connecting with existing and proposed (by others) routes will increase the propensity for cycle-based trips to/from the site, reducing car borne journeys.

6.2.4 Future Active Travel Measures

The Greater Dublin Area Cycle Network Plan sets out a 20-year strategy to expand the urban cycle network from 500km to 2,480km. The overarching ambition of the plan is to increase the number of commuters who travel by bicycle the same amount by those that commute via bus. The plan focuses on local routes to better connect the GDA towns and improve infrastructure for trips of less than 10km in distance.

The Greater Dublin Area (GDA) Cycle Network Plan identifies a network of intra-urban and urban cycle routes across the GDA. Leixlip is in the North Kildare Sector Town Cycle Network within the Greater Dublin Area (GDA). Figure 15 shows the wider network and the key cycle routes in proximity of The Wonderful Barn site, which include the following:

- K1 Royal Canal Greenway (shown in green on the below).
- LP1 R148 Main Street and Maynooth Road to Intel Plant cycle route.
- LP2 Barnhall Road to Celbridge via Castletown Demesne cycle route.

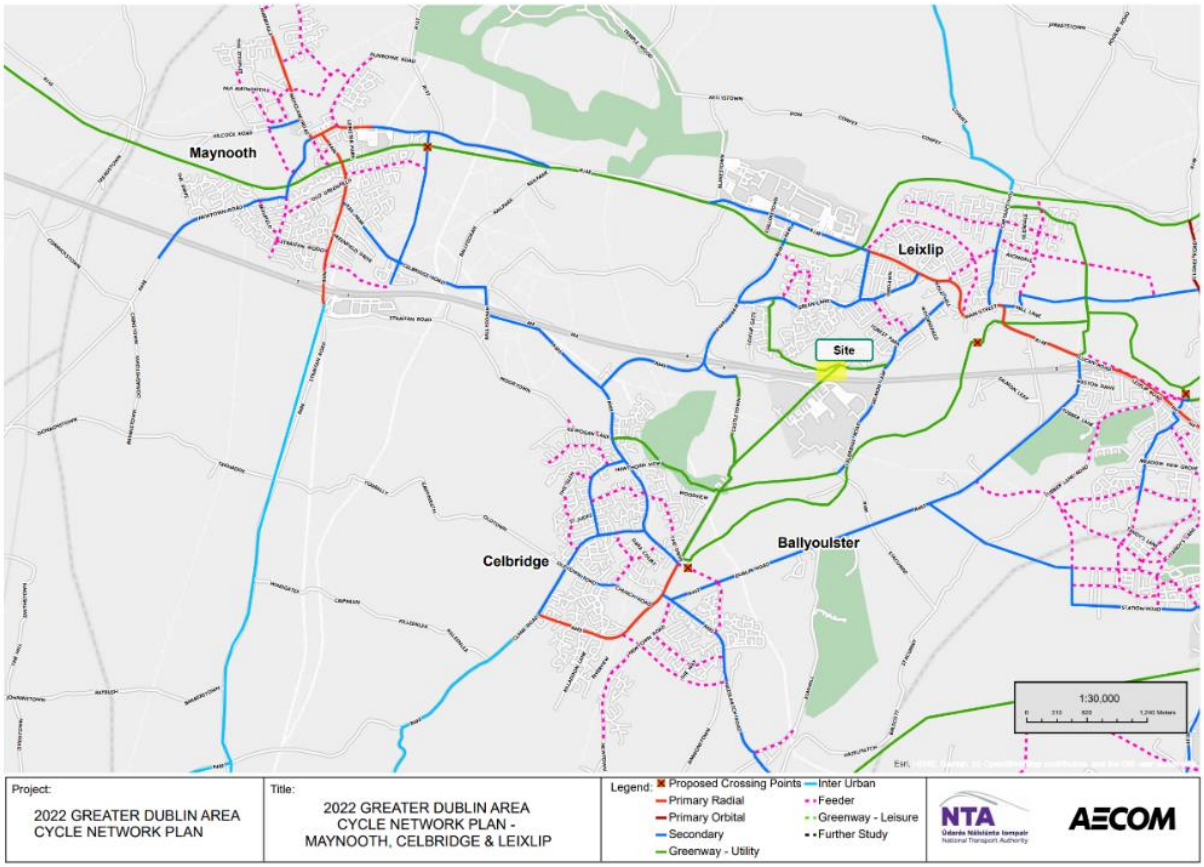

Figure 15. Strategic GDA Cycle Network

Source: Extract from NTA, GDA Network Plan, 2023

The section highlighted in yellow in Figure 15 includes a prospective pedestrian/cycle overpass over the M4 Motorway secured by the Kildare Innovation Campus planning permission (ref: 2360047) that will connect Celbridge, to the south with The Wonderful Barn site. The provision of this connection across the M4 also forms Walking and Cycling Policy MT1.11 of the Leixlip Local Area Plan (2020 – 2023, extended to 2026) which states, "*To support the delivery of a pedestrian and cycle overpass of the M4 to link The Wonderful Barn at Leixlip to Castletown Demesne in Celbridge in consultation with Transport Infrastructure Ireland (TII).*"

6.3 Electric Vehicle Charging Points

100% of on-site car parking is proposed to be equipped with electric vehicle charging (active and passive) provision, ensuring future proofing of the site, and preventing the need to lay cabling in the future as demand for electric vehicle charging increases.

7. Sustainable Drainage (SuDS)

The proposed Wonderful Barn development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS) in accordance with the guidelines of the Greater Dublin Strategic Drainage Study (GDSDS), the SuDS CIRIA Manual C753 and the South Dublin County Council (SDCC) Sustainable Drainage Explanatory Design & Evaluation Guide 2022. The aim of the proposed drainage system is to replicate the natural characteristics of greenfield rainfall run-off to minimise the environmental impact from rainfall events by reducing the run-off leaving the site for small rainfall events.

SuDS are designed to manage water quantity reducing / preventing the likelihood of flooding from the proposed development and to maximise the opportunities and benefits from surface water management.

Policy GI4: Sustainable Urban Drainage Systems from the SDCC Sustainable Drainage Explanatory Design & Evaluation Guide 2022, is set out in the figure below:

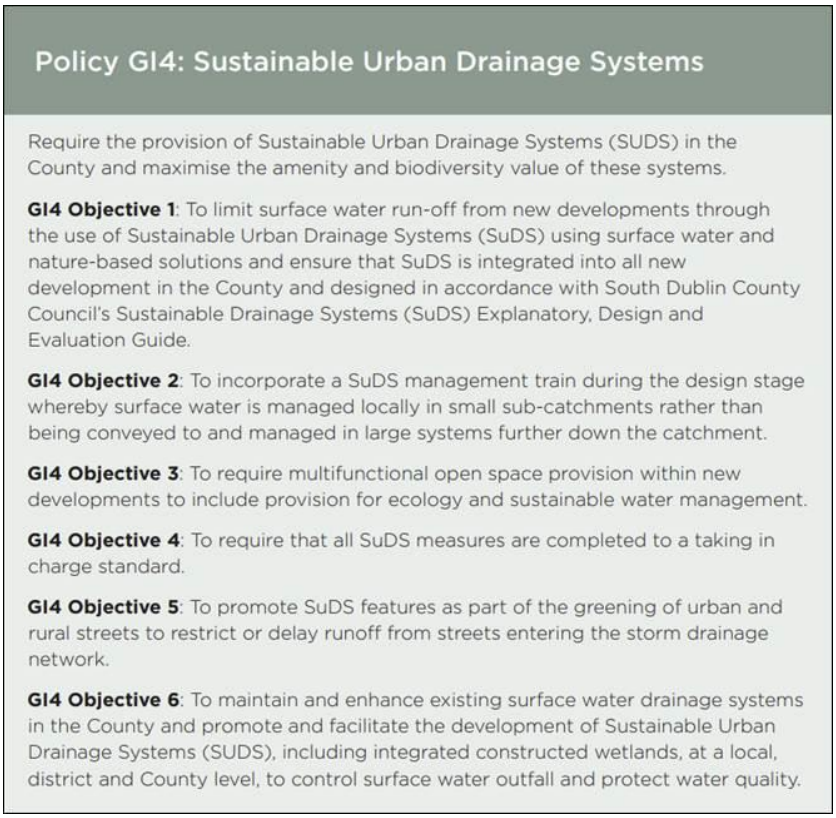

Figure 16. Policy GI4: Sustainable Urban Drainage Systems

Source: SDCC Sustainable Drainage Explanatory Design & Evaluation Guide 2022

Based on the existing site topography, proposed site layout and nature of the proposed development alternative SuDS measures have been provided to treat the surface water runoff and to replicate the natural characteristics of the greenfield runoff. This will minimise the environmental impact. The proposed SuDS are listed below:

- Infiltration basins
- Infiltration trenches / filter drains;
- Permeable paving / porous asphalt;
- Swales;
- Flow control device.

Refer to AECOM drawing 60689541-ACM-XX-XX-DR-CE-0521 to 0525 for the proposed SuDS layout.

7.1 Proposed Surface Water Network:

Surface water from the proposed development shall discharge in accordance with the sustainable drainage policies set out in the GDSDS. In accordance with such policies, surface water from the site will be managed through the use of sustainable surface water measures, which will improve water quality, reduce surface water discharge volume, and provide biodiversity and amenity value.

This will be achieved using infiltration basins, swales, and other SuDS measures across the development. Any excess surface water remaining, following infiltration and subsequent attenuation, will be piped to the existing surface water network towards the southern end of the development site.

The surface water discharge rate from the proposed development will be restricted in line with GDSDS requirements. For this proposal, the discharge rate will be restricted to 2 litres per second,

which lies within the required discharge rate limit of 2 litres/second/hectare. Flows in excess of the allowable discharge rate will be infiltrated and attenuated on site for storms up to and including a 1 in 100-year rainfall event, with an additional 30% allowance for climate change.

The proposed surface water strategy has been designed and modelled using Innovyze MicroDrainage. The following standards have been followed in the design of the proposed surface water drainage network for the site:

- BS EN 752 – Drains and sewer system outside buildings.
- Greater Dublin Strategic Drainage Study (GDSDS) Volume 2 – New Developments.
- No pipe flooding during a 1 in 100-year return period rainfall event.
- Surface water storage sized based on a 1 in 100-year return period rainfall event.
- An additional 30% has been allowed for climate change in relation to rainfall intensities.

The following design criteria have been used in the design of the proposed surface water drainage network:

- Colebrook White roughness value of 0.6mm for all pipework.
- Time of entry: 1 minutes.
- Return Period: 5 years.
- M5/60 = 16.1mm (Met Éireann rainfall data for site).
- Ratio r = 0.277 (Met Éireann rainfall data for site).

8. Landscaping

The landscape strategy of the wonderful barn site prioritizes biodiversity conservation by integrating native plant species into the design. By retaining much of the existing natural assets and incorporating an additional diverse array of native vegetation into any new planting areas, it will create habitat corridors and foraging areas for local wildlife, supporting the preservation of biodiversity within the site and its surroundings. Additionally, the inclusion of green spaces and vegetated buffers not only enhances the aesthetic appeal of the repurposed barn site but also provides crucial refuge and breeding grounds for various plant, insects, and small animal species.

The landscape strategy also outlines the retention and protection of as many existing trees as possible. A substantial amount of new tree planting is also proposed to replace any existing trees that have been removed or areas where new tree planting could be beneficial.

In line with sustainable practices, our landscape strategy, along with that of the Civil Engineer’s, employs innovative rainwater management techniques to mitigate stormwater runoff. The design incorporates permeable surfaces such as porous pavements, allowing rainwater to infiltrate into the soil instead of flowing into conventional drainage systems. Furthermore, strategically positioned rain gardens and bioswales effectively capture and filter stormwater, reducing the need for additional drainage systems as well as reducing the risk of flooding.

The potential use of interpretive signage and educational programs can be incorporated throughout the site to raise awareness about sustainability principles, local ecology, and the historical significance of the barn and its surroundings. Visitors are encouraged to engage with the landscape, fostering a sense of stewardship and appreciation for the natural and cultural heritage of the parkland site.

By integrating these sustainability features into the landscape strategy, harnessing nature-based solutions and protecting and enhancing what is existing, the Wonderful Barn site not only preserves its historical and ecological integrity but also serves as a model for responsible land stewardship and community engagement, contributing to the resilience of urban ecosystems in the face of climate change.

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